

tubercles inconspicuous in most specimens. Thoracic and anal shields concolorous. Feet concolorous or slightly infuscated. Length when full grown 44 to 48 mm., width 6 to 8 mm.

These larvæ were very active through all their stages, and when full-fed wandered about a good deal. On July 26 most of them were full-grown, and many buried and pupated in oval cells about four inches below the surface.

Pupa.—19–23 mm. long, 5.5–6.5 mm. wide at widest part, rather slender, abruptly pointed at anal end; dark chestnut brown, shining. Anterior third of abdominal segments deeply and coarsely punctured. Cremaster conical, black, deeply roughened and grooved longitudinally, with a pair of slender terminal rigid bristles 0.7 mm. long, separate but close together, with the tip of each expanded into a button with recurved edges.

The pupæ were kept in a cool cellar all through the winter, and were brought up to the office about the end of April. The moths emerged from May 4 to 26, three or four weeks earlier than the species was collected outside.

Food-plants.—Up to Stage IV the larvæ were fed chiefly on clover, grass and dandelion, but as they did not seem to be growing fast enough they were changed to Bleeding-heart (*Dielytra spectabilis*), specimens having been found in considerable numbers on this plant at the Experimental Farm. Other plants which seemed to be particularly attractive to these caterpillars in a state of nature were Larkspurs, of which the seed-capsules were much injured, Spinach and Cabbage. They are, however, rather general feeders, but being nocturnal in habit, their food-plants were rather difficult to detect.

THE CLASSIFICATION OF THE CULICIDÆ.

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In the revision of my Manual of North American Diptera, now in press, it has been necessary for me to examine critically the recent publications on the classification of the Culicidæ. Although I have never ceased to be an interested reader of dipterological literature, I was hardly prepared for the flood that has nearly swamped me in the attempt to reach *terra firma*.

It is unfortunate that, among the score or more who have written upon the classification of this family within the past six years, nearly all have been amateurs in entomological taxonomy, some, indeed, whose only papers on entomology have been those proposing new "subfamilies." I

do not wish it to be inferred by my statement that I impugn the ability of many of these writers ; far from it. The fact, nevertheless, remains, that no one is competent to discuss philosophically the classification of any group of animal life who is not well grounded in the principles of taxonomy as applied to related animals. And the ignorance of related Diptera has been, more than once, deplorably shown by writers on the Culicidæ. A writer who persistently calls the beginning of the third longitudinal vein a "supernumerary cross-vein," and the fourth posterior cell the "anal cell," without in the least attempting to show that the standard authors on Diptera have been grievously in error, is, from the very nature of the case, incompetent to discuss classificatory characters, since the mosquitoes are not organisms isolated from all other living creatures.

It may be urged, on the other hand, that not being a specialist in the Culicidæ myself, I am not competent as a critic, and that is possibly true. I have, however, studied patiently a dozen or twenty of the so-called new genera of the mosquitoes, and have a more or less critical acquaintance with at least a thousand other genera of Diptera in all families, and I humbly submit that it is not necessary, at least for one whose taste is not depraved, to devour a whole sheep in order to detect the flavor of mutton.

Until within recent years, dipterologists were content to classify the known Culicidæ in a half dozen or so genera, genera which could be defined by characters equivalent to those used for generic definition in the allied families. With the great impulse given to the study of the mosquitoes by the marvellous economic discoveries of recent years, it was only to be expected that many new forms would be brought to light, and new structural characters discovered. The Culicidæ in the past had been generally neglected by students of Diptera, for two chief reasons: the frailty of the insects themselves and the difficulty of preserving them intact, and the recognized difficulties of their study. It naturally was very desirable, with the great influx of new forms, both for scientific and economic reasons, that relationships should be more closely defined than had hitherto been done. The results so far have been that a few new genera, based upon characters equivalent to those previously used, have been established, and that the other old genera have been broken up into scores of groups, to which the designation of genus has been, correctly or incorrectly, applied.

Theobald, in his recent discussion of the genera of the world, recognizes about seventy-five genera, and has promised more. American writers, with no less modesty, have proposed a score or so additional ones.

Altogether, then, perhaps a hundred generic names have been offered for the acceptance of students of Diptera.

Coquillett, in his recent paper on the North American mosquitoes, has attempted to define forty-one genera, eighteen of which contain a single species each, and eight others but two species each. The whole number of species included in these forty-one genera is about one hundred and forty, or an average of about three and a half species to each genus. It might be added, for the encouragement of the genus maker, that there is still room for nearly one hundred genera before each of our species has a generic name all to itself—and there seem to be plenty of characters, such as they are, for the manufacture of these new “genera.”

And what is the result? As has been said by others, and as I can corroborate, for the most part it is simplest to determine the species first from their descriptions, and then, of course, the generic determinations are easily ascertained by reference to the catalogues. And there has been not a little guessing done by some of the most prolific writers, as might be shown, were it worth while.

It is Theobald to whom we are indebted for the larger part of the proposed genera. He urged, and rightly, that there were too few genera, for convenience sake. It is very true that, in some other families of Diptera, as, for example, the Tabanidæ, we are not greatly disturbed by large numbers of species in a genus, and even reject many proposed divisions that do not divide. I frankly confess that I am so old-fashioned that a genus means something more to me than an additional name for a species, and do not like to see divisions made on the score of convenience alone. Venational and plastic differences there are few among the mosquitoes; palpal and antennal characters it was thought had been used to their limit; and there seemed nothing left but the character of the vestiture. Theobald insists that he has found trustworthy generic characters in the shape and distribution of the scales of the body and wings. In a measure he may be right, but when it comes to the differentiation of genera, and even subfamilies, by the aid of a few scales alone (*e. g.*, *Phagomyia*, Theobald, “is allied to *Stegomyia*, but is separated by the narrow-curved scales on the lateral lobes of the scutellum”!) whether they are broad or narrow, curved or straight (Theobald lists seventeen kinds of scales), with their countless permutations in the different parts of the body, I protest that triviality has reached its limit. He insists that if a horse were covered with scales instead of hair it would be at once recognized as of a different genus from *Equus*. I have been a student of the vertebrates for thirty

years, and beg to express my decided dissent from such a proposition. If a horse were clothed with scales as large as saucers, with *no structural differences*, it would not be tolerated as a distinct genus. But such examples are hardly pertinent here. A graver charge is that Mr. Theobald believes that palpal characters should not be used, because of the difficulty of detection. In other words, we should not trouble ourselves about natural or genetic characters when they are difficult to observe, but use artificial ones that may be easily seen. However, he urges that the palpal characters are not as true indices of relationships as are the scale characters. This is important if true, but I am bold enough to say that it is not true. In all other families of Diptera the structure of the palpi has been found safe in classification, and it would be strange indeed if the mosquitoes should prove to be an exception. And Mr. Theobald is hardly consistent; he readily uses certain palpal characters for the definition of subfamilies, but denies to others generic value. And it must be remembered that Mr. Theobald bases his ideas of relationships almost exclusively on scale characters, and it is no wonder that he reasons in a circle. My own conclusion is that characters derived from the shape of the scales are both artificial and inconvenient, and at most only of specific value.

The proposal of a host of genera based upon such trivial characters is bad enough, but words fail me in my expression of amazement at the proposition to base a dozen or more subfamilies almost wholly upon secondary sexual and scale characters. Secondary sexual characters are looked upon universally by taxonomists as of very doubtful generic value, and very rarely have they been accepted. Here we would have them do duty as primary divisional characters in the family. Theobald naïvely says that the males of his *Toxorhynchitinae* can not be distinguished from the males of his *Megarhininae*, even generically. "The females of the *Culicinae* and *Edomyinae* are so alike that, without the examination of the males, it is not always possible to place them in the right subfamily." Coquillett, who has tried to avoid secondary sexual characters in his definition of the subfamilies, separates, for example, his *Psorophorinae* and *Culicinae*, as follows:

- "Femora bearing many outstanding scales; wing scales
 narrow *Psorophorinae*.
 "Femora devoid of outstanding scales (except in the genus *Edomyia*.
 which has broad wing scales) *Culicinae*."

Of all the writers, one would have thought that Coquillett would have recalled the fate of Brauer's numerous "families" of the Tachinidæ, and have refrained from the use of such trivial characters. Think of it, a subfamily distinguished ultimately by "broad" or "narrow" wing scales!

But this is not the worst, though bad enough. Theobald found a certain specimen with a scaled seventh wing vein, and straightway elevates it to generic and subfamily rank, the Heptaphlebomyinæ! Just imagine that character or its equivalent being used singly as a subfamily character in the allied families!

Nor is this all. Mr. Theobald has suggested, and I regret to see that Coquillett, from whose wide acquaintance with Diptera we should expect better things, adopts the suggestion, that the Corethrinæ should be separated from the Culicinæ as a distinct family of Diptera; and, ergo, the family Culicidæ be raised to superfamily rank. Because, forsooth, *Corethra*, while identical in venation, bodily structure, larval habits and structure, does not have piercing mouth organs. Imagine such a proposition coming from Loew, Schiner or Osten Sacken! Suppose we apply this criterion elsewhere in the Diptera, and witness the results. *Stomoxys* and its allies become the Stomoxiidæ (and the Muscinæ are only a subfamily at the best); *Ceratopogon* and its allies the Ceratopogonidæ (and the group is far more widely separated from the other genera of the Chironomidæ); *Phlebotomus* the Phlebotomidæ, etc. What a pretty classification we should have if we used the mouth structure alone for family divisions in the Tipulidæ, Chironomidæ, Cecidomyidæ, and the Cyrtidæ, for example. Even the Bombyliidæ, and many of the groups of the Muscidæ, would be stampeded. Coquillett, at least, knows that the three or four "new" families that have been proposed in recent years, all of them with more distinctive characters than the Corethrinæ possess, have been unanimously rejected by dipterologists. How, then, do the culicidologists expect to receive greater consideration? It would almost seem that they consider themselves as without kin to other entomologists, and that whatever they say is, *ex cathedra*, incontrovertible.

There are but two subfamilies of the Culicidæ, unless we admit the Dixinæ, which I strongly favour, the Culicinæ and Corethrinæ, and any groups of either are of lower rank, mere tribes. And we should not want a dozen subfamilies if the genera had not been so debauched.

But discussion is idle. The sanest classification so far is that of Coquillett, but that is not saying a great deal. The family yet awaits a thorough taxonomical revision. Meanwhile my advice to the general student is to ignore all those genera based upon scale characters, and call his species, as of yore, *Culex*, *Ædes*, *Anopheles*, etc.